

## **2. Low-Cost Messaging Systems**

In addition to the general need for new personal communications technologies to fill a clear void in the product-market grid shown above, there is also a market among commuters for low-cost messaging systems. The following statistics indicate very well the magnitude of the problem.

- 110 Million commuters now exist in the U.S.
- Urban traffic delays among these commuters are projected to increase 50% by the year 2005.
- Annual cost for excess or wasted travel, mostly avoidable with better low-cost mobile communications, is estimated at \$46 billion!

The STARNET system will enable millions of consumers and business people to send and receive messages at low cost. No other private satellite system yet developed has the low cost and high capacity of the STARNET system proposed herein.

In practice, messages will be typed out on a simple keypad for immediate transmission via the STARNET system. The Processing, Analysis and Control Centers (PACCs) will be capable of storing various address lists for the user. Hence, brief names such as "G. Bush", "Dad", or "Office", will be all that is needed for an address. The PACCs, after recognizing the user's chip ID (burned in at the factory), will then look for the address. Recognized addresses will be those stored in the PACC system memory (programmable via 1-800-STARNET voice response system), or other ID codes. After the address, the STARNET system expects a message of up to thirty-two (32) characters. Users will key in messages when stopped in a car, from their offices or homes, or even from remote areas such as at the beach or in the mountains. The message will then be sent by STARNET via whichever medium is indicated by the stored address. These media

may be fax, phone (with digital speech output), telex, PC or another STARNET user terminal.

The market for STARNET's low-cost two-way messaging service could be nearly as large as the U.S. population. The user terminals will be easy enough for a child to operate. The capturable market forecast for the STARNET system is 25% of the current U.S. commuting population, or approximately 25 million persons.

### **3. Remote Home Management**

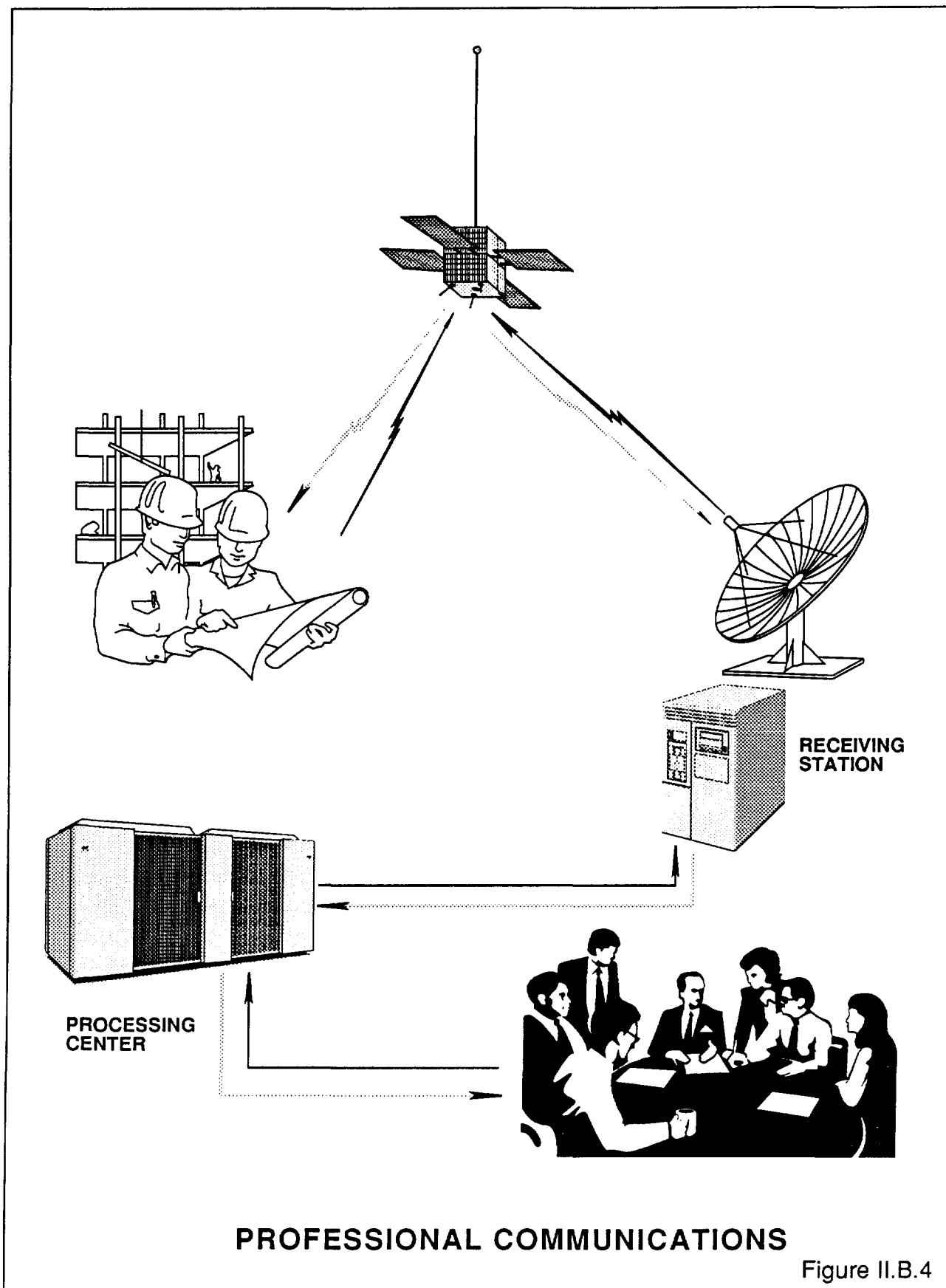
The STARNET system may be used remotely for controlling the basic functions of a house. Both vacation and primary homes can have their heat, light and air conditioning controlled remotely via STARNET.

The potential market for this service can be quantified as equal to the 185 million electric, gas and water meters in the U.S. An addressable market can be quantified as equal to the 89 million U.S. homes with utility service. Applicant projects it will capture 1% of these homes, or 890,000 customers.

### **4. Global Messaging Networks**

Many government agencies and industrial corporations have focused on two key trends for the 1990s - digital communications (information technology) and globalization. It is commonly accepted that the world's economies, and even to some extent societies, are highly intertwined. Furthermore, the trend direction is toward even greater global integration.

It is ironic that the global digital world is missing a low-cost global digital messaging network. STARNET resolves that irony by putting into the pocket of any international business person, government official, journalist or tourist a \$75 calculator-sized device capable of global digital communications (see Figure II.B.4).



Many American business people suffer frustration in trying to get messages to home offices or to families when in distant countries, with few English speakers, and often overloaded telecommunications circuits. These frustrations are shared by the Japanese and other foreign business people trying, with little English, to get messages through busy American hotel switchboards. All too often the messages left for visiting foreign business people on pink message slips bear a mis-transcribed name, an improper number of phone digits, and a cryptic message.

The STARNET system will go a long way toward resolving these and other global messaging problems. From Nepal to Namibia, and everywhere in between, the American traveler will be able to send and receive digital messages on his or her \$75 STARNET pocket terminal. Similarly, Applicant expects that travel and entertainment companies, such as American Express, will offer the STARNET terminals to foreign business people and others visiting the United States.

The potential market size for Applicant's global messaging service is one million units per month, the number of international travelers to the and from the United States. Since many of these travelers are repeat visitors, the addressable market is considerably smaller, estimated at 200,000 units per month, or 2.4 million units per year. Ultimately, the STARNET system is expected to capture 15% of its customers in this market segment.

### **C. TELEMEDICINE APPLICATIONS ADDRESSED BY STARNET**

One of the most revolutionary aspects of the STARNET proposal is its "democratization" of satellite technology down to the \$75 per terminal. With this vastly broadened access potential, entire new vistas of market potential become available. These new vistas, such as telemedicine and recreational electronics, were not plausibly within sight of existing big satellite user "hardware", with weight measured in pounds and costs counted in thousands. With the STARNET system, pocket portable

satellite terminals will literally change the way society thinks about distance and communications.

### **1. Outpatient BioSensor Monitoring**

With continued dramatic drops in the price and size of microprocessor-based devices, such as bio-sensors, it is now possible to carry a sophisticated piece of medical electronics in shirt pocket size (see Figure II.C.1). At the current rate of miniaturization it is already reasonable to carry on an outpatient monitoring program for certain conditions via remote telemetry. As this trend grows, especially with the expected substantial growth in health care burdens, the STARNET system is able to provide a uniquely valuable telemedicine service.

### **2. Remote Pacemaker Monitoring**

STARNET will allow accurate monitoring of a heart condition for outpatients equipped with Pacemaker devices. Miniaturized biotechnology will radio-trigger the STARNET terminal when pre-determined hazardous conditions are reached, and automatically provide medical information to the patient's doctor. He or she will be able to make the proper decision after medical consultation.

### **3. Preventative Telemedicine Technology**

STARNET telemedicine application also include monitoring key vital signs of outpatients enjoying recreational activities. It is always unfortunate to suffer health problems, and extra efforts are hence called for to permit this sector of our population to enjoy as full a life as possible. While home-based Medic Alert systems are enjoying wide application, due to nearly universal telephony, there is no comparable system for time spent outdoors. The STARNET system will be able to

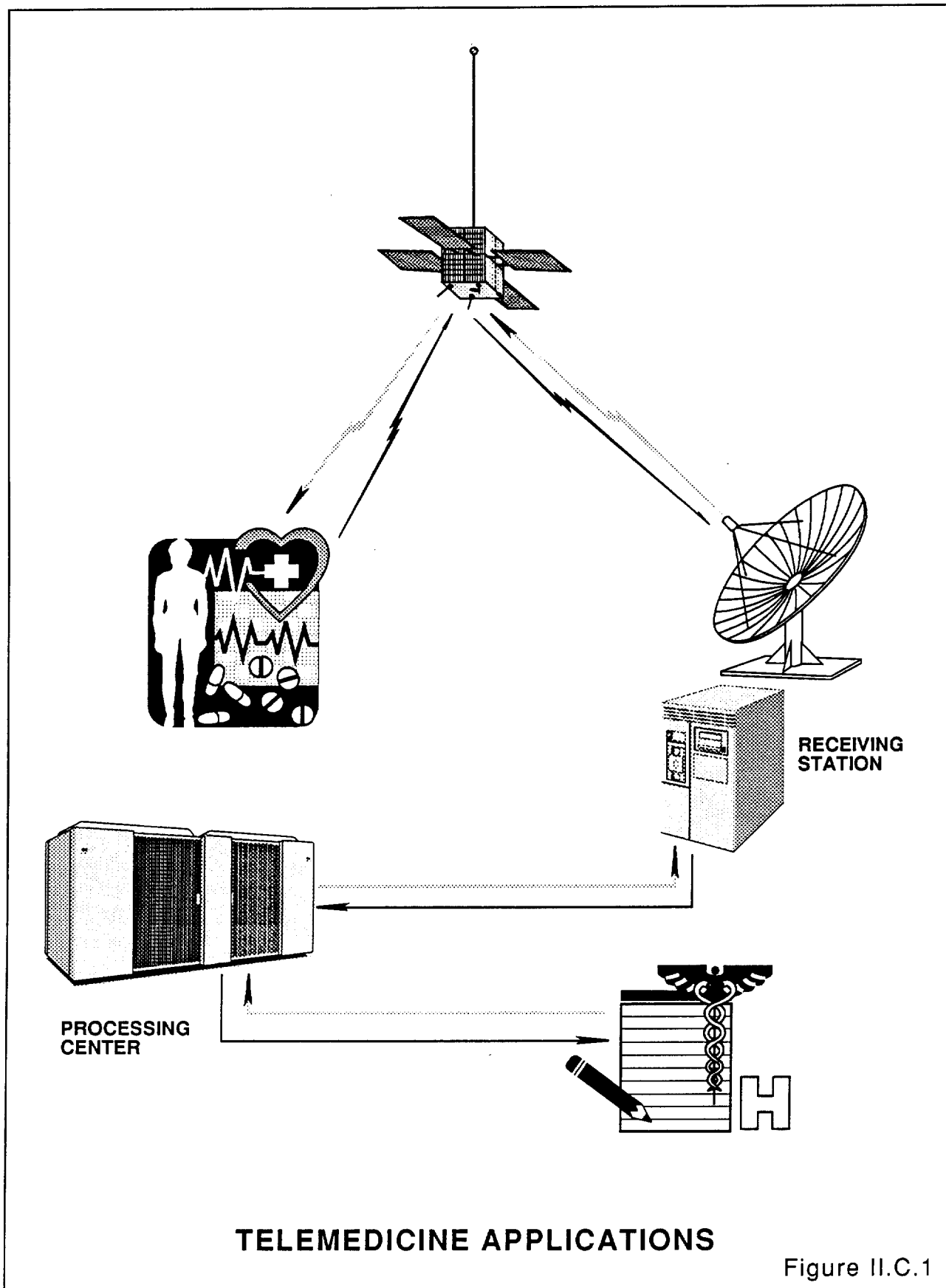


Figure II.C.1

fill this void, whether the user is on a beach, in the desert, or visiting a national forest.

#### **D. ENVIRONMENTAL PROTECTION MISSIONS SERVED BY STARNET**

The STARNET system authorized pursuant to this Application will make a major contribution to environmental protection. It is worth noting that STARNET's contribution will be both *direct* - such as in the vehicle emission, air and water quality monitoring applications discussed in this section, and *indirect*, such as by reducing wasted travel, as described in the previous section on Low-Cost Two-Way Messaging markets.

##### **1. Vehicle Emission Monitoring**

Vehicle emissions are one of the largest contributors to pollution. Indeed, the New York City government recently announced that air quality had deteriorated there (after several years of improvement) due to the increased number of vehicles on the road. Toward this end, the federal and state governments have repeatedly imposed ever lower limits on the emission of various pollutants from consumer and industrial vehicles. However, it is virtually impossible to enforce these vehicle pollution controls on a continuous basis. It is well known that many of America's 170 million vehicles need to have their emission control systems serviced. This failure in the vehicle emission control pillar of modern environmental protection policy can be ably addressed with a cheap STARNET/pollutant sensor coupler.

Unical Chairman Richard Stegmeier recently said that older cars cause up to 30 times the pollution of newer models. Proposals have been made to help clean up Los Angeles by paying \$700 each for the first 7,000 pre-1971 cars turned in, offering free emission inspections and anti-pollution adjustments on pre-1975 cars, and patrolling freeways to get traffic-clogging stranded motorists rolling again. These plans could cost many millions of dollars in the next two years. STARNET's vehicle monitoring capability is part of a new movement of finding

ways to cut pollution that are easier, quicker, and cheaper than clean-air proposals being debated on Capitol Hill.

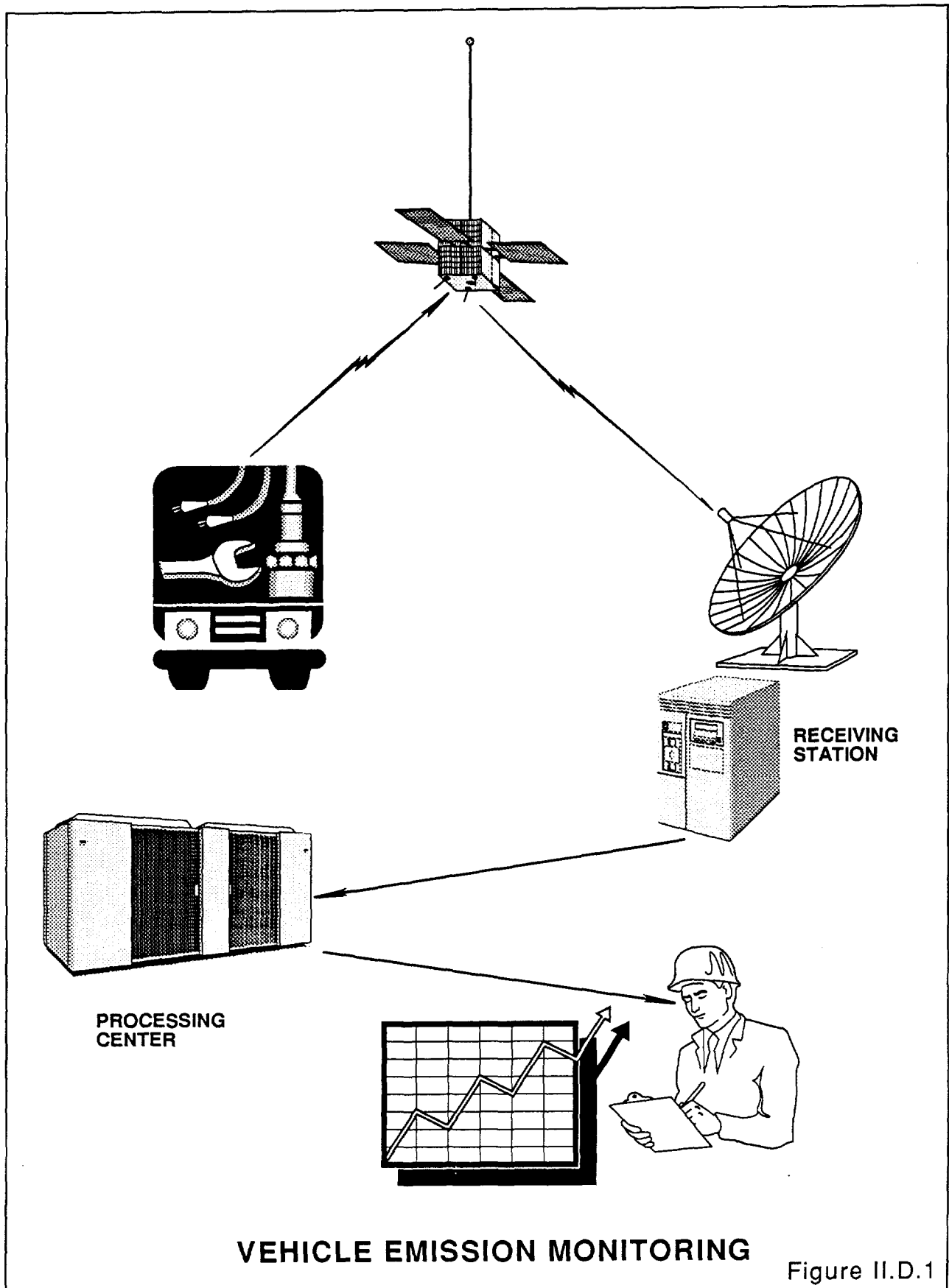
Applicant has not made any quantitative forecast for the use of STARNET as a pollutant monitoring system. Nevertheless, it may reasonably be expected that the country's 2 million trucks would be a likely first target for a system imposed by Congress or the Environmental Protection Agency. These trucks are already subject to numerous federal regulations, including pollution control equipment and various safety equipment (see Figure II.D.1).

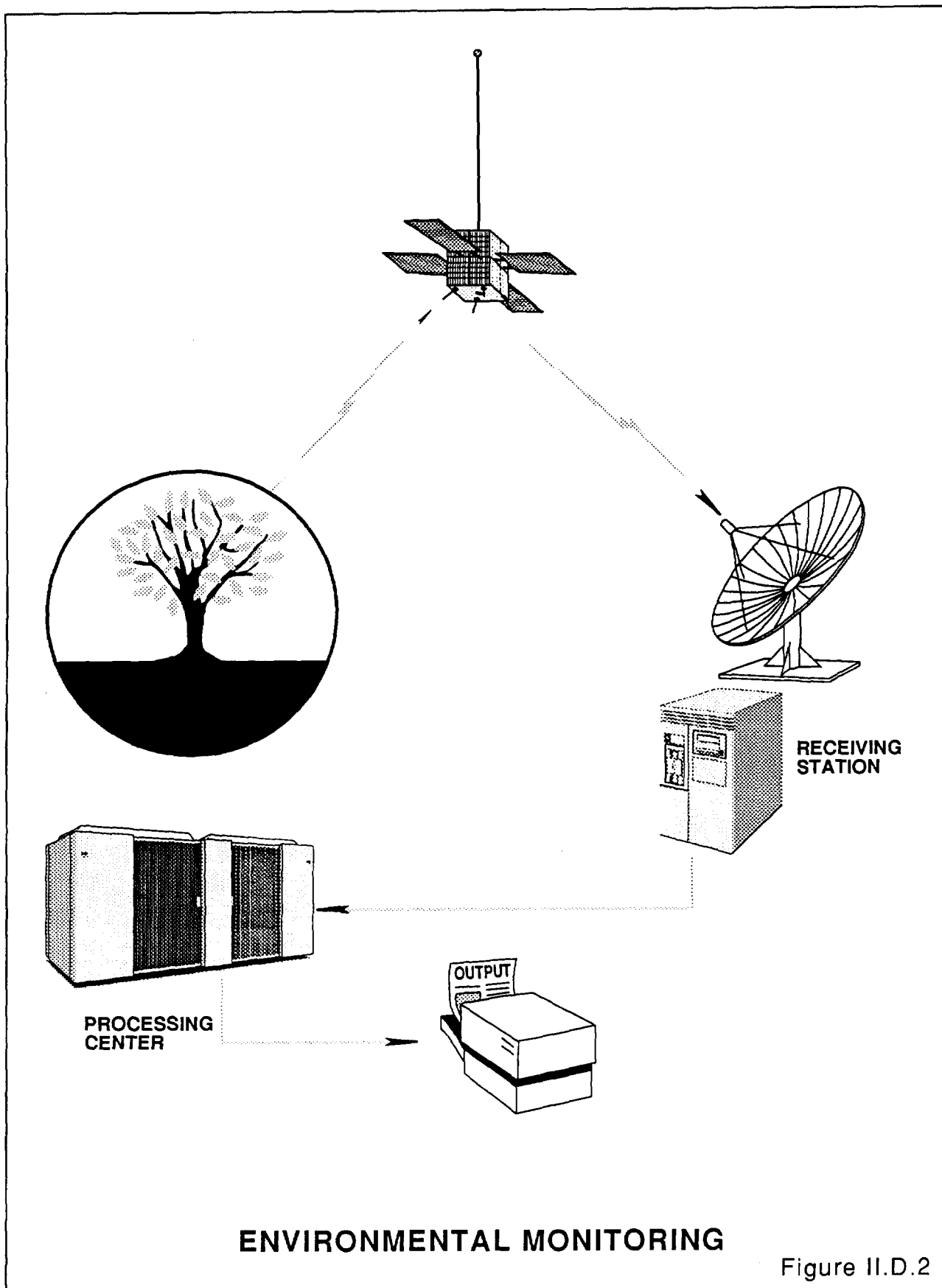
## **2. Air Quality Ambient Condition Monitoring**

As America continues to clamp down on its environmental issues, there is a widely recognized need for continuous in situ ambient condition monitoring throughout the entire country. The purpose for monitoring is both to determine, over time, if there are changes in the environment and to ensure that local industries are complying with existing regulations.

To date, there has not been any ambient condition monitoring technology that is affordable for a nationwide program. New Jersey, for example, uses VSATs as part of a flood warning system based on 31 rain gauges. This network alone cost the state over \$1 million to install and nearly \$300,000 a year to operate. (Nevertheless, it is reported to have saved at least \$2 billion in potential flood damage).

The STARNET terminals, at less than \$75 each, are the first satellite technology affordable enough for mass deployment with appropriate air quality sensors. In this regard, STARNET's LEO mobile satellite service technology can be expected to make an important contribution to environmental protection (see Figure II.D.2).





## ENVIRONMENTAL MONITORING

Figure II.D.2

### **3. Water Quality Ambient Condition Monitoring**

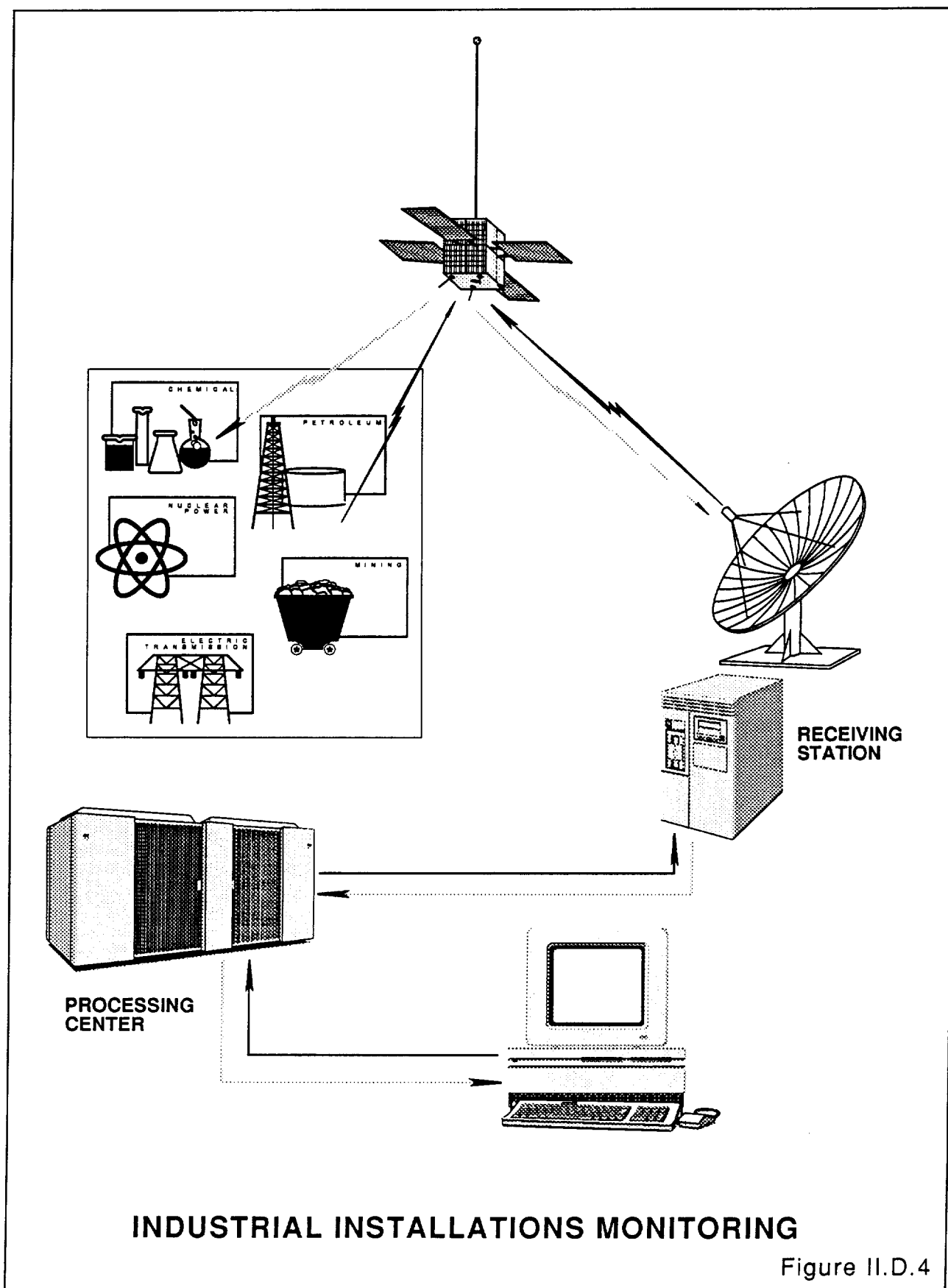
Water quality monitoring, as with air monitoring, requires many thousands of radio-reporting sensors to perform an effective wide-area job. In the past, with non-commercial systems, there was too small a user base to provide ultra-low-cost user satellite terminals. Applicant has incorporated many innovative changes into its STARNET system to vastly increase its capacity. This huge capacity, in turn, enables broad commercial utilization and hence ultra-low-cost user terminals. With water-proof versions of these new user terminals, hydrological ambient conditions will be able to be measured on a continuous basis over vast portions of salt and fresh water.

The STARNET system will also make a major contribution to NASA's Mission to Planet Earth by providing in situ data from water-borne user terminals as a complement to the vast harvest of data from satellite imaging equipment scheduled for launch in the 1990s and beyond. In situ data from STARNET terminals will also help scientists better understand changes in the contaminant levels of the ocean due to various pollutants. Resultant conclusions based on STARNET data may help to save millions of people from premature illness or death due to cancer-causing hydrologic pollutants at excessively high levels.

### **4. Remote Well and Pipeline Monitoring**

Thousands of remote wells and pipelines lack telemetering capability; VSAT's are often too expensive. STARNET can help address this need with a very low cost telemetering terminal.

There are over 500,000 active and remote oil/gas wells in the U.S. Also, thousands of pipelines will typically have dozens of pumping stations along their routes, each requiring up to 15 monitors for very frequent communications with control centers. The STARNET low-cost terminals can readily satisfy these needs (see Figure II.D.4).



## **E. RECREATIONAL ELECTRONICS MARKETS FOR STARNET**

The recreational electronics market is growing rapidly with the fuller development of American resort areas and the health/exercise orientation of ever-growing numbers of people. The STARNET system expects a large recreational electronics market with its ability to directly address several key customer needs:

- sense of security in case of emergency;
- maintain communications if necessary;
- reduce instances of lost outdoor enthusiasts;
- revenue growth needed by equipment rental firms;
- reduction of resort insurance rates.

### **1. Satellite Search and Rescue Technology**

Applicant's market research indicates that a satellite search and rescue product would be a "must have" for vacationers going anywhere far removed from telephones. Such regions include National forests, mountains, wilderness areas, and deserts. At a price of \$75, market research indicates that a STARNET terminal would be considered as necessary as comparably priced items such as tent, backpack and Gore-Tex clothing. Applicant is conservatively projecting an ultimate capturable market of three million user terminals in this market segment - less than the number of National park visitors each year.

In addition, a large search and rescue market exists for locating lost boaters. There are over 12 million pleasure boats in the U.S. Assuming 90% of these are very small local boats, capturing 10% of the larger boats implies a customer base of 120,000 pleasure boats (see Figure II.E.1)

### **2. Remote Area Communications Capability**

Aside from search and rescue applications, there is a general day-to-day need for remote area communications capability among people

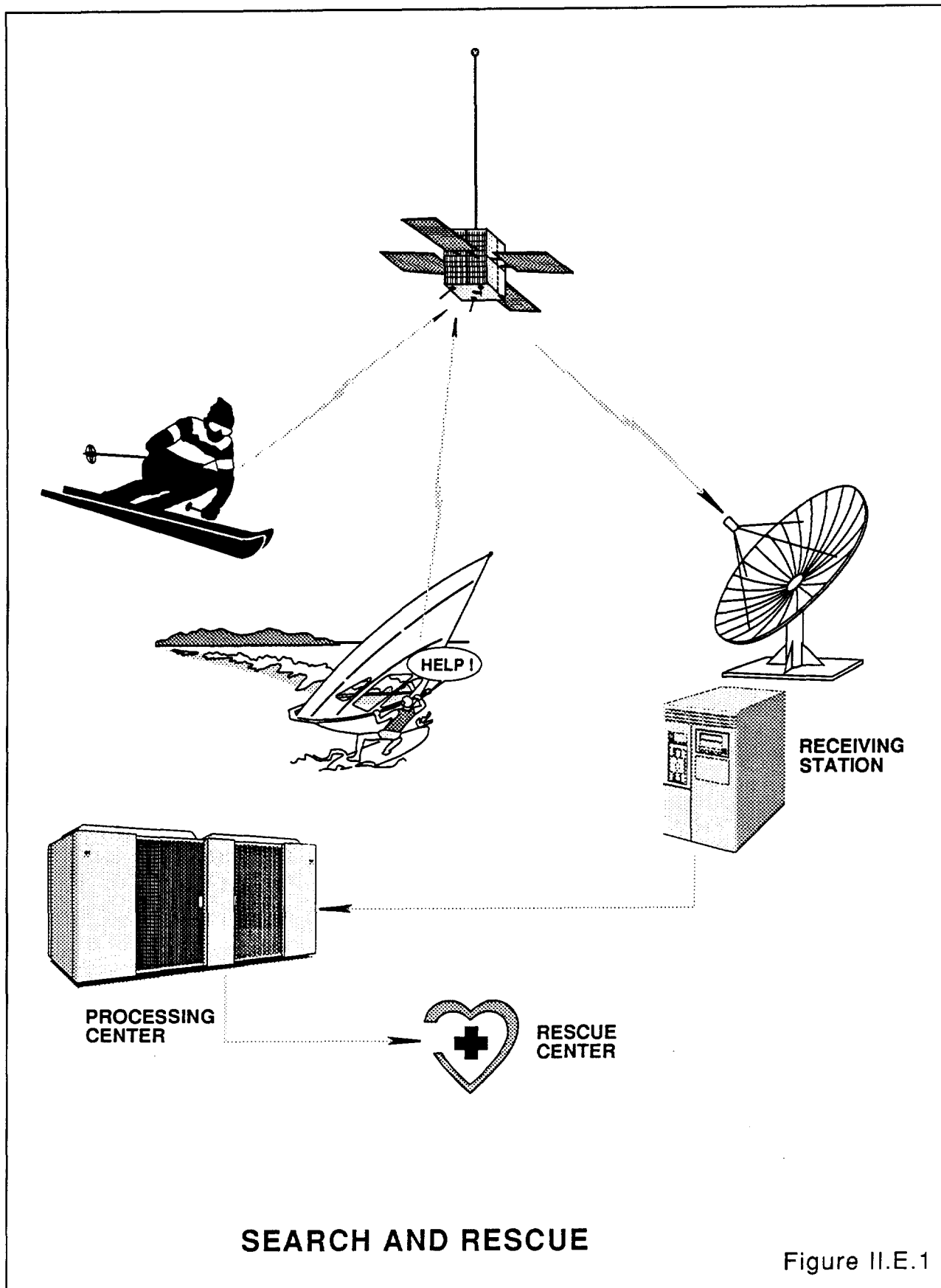


Figure II.E.1

living in such locales. While universal telephony will soon be available, through such innovations as IMM's UltraPhone, AMSC's Satellite Phone, and GMC's Digital Phone, most rural people will find these technologies too expensive or awkward for use outside of their vehicles. For example, two cooperating nature researchers or ski rangers on opposite sides of a mountain would probably prefer a cheap STARNET message to an expensive phone call via satellite.

In a similar vein, groups of backpackers, anglers, or cross-country skiers would find STARNET a convenient and inexpensive way to stay in touch during the day. Satellite phones are not likely to be practical for such common outings, although they can certainly be expected in most high-end rural vehicles.

#### **F. MARKET FOR HANDICAP-SUPPORT TELECOMMUNICATIONS**

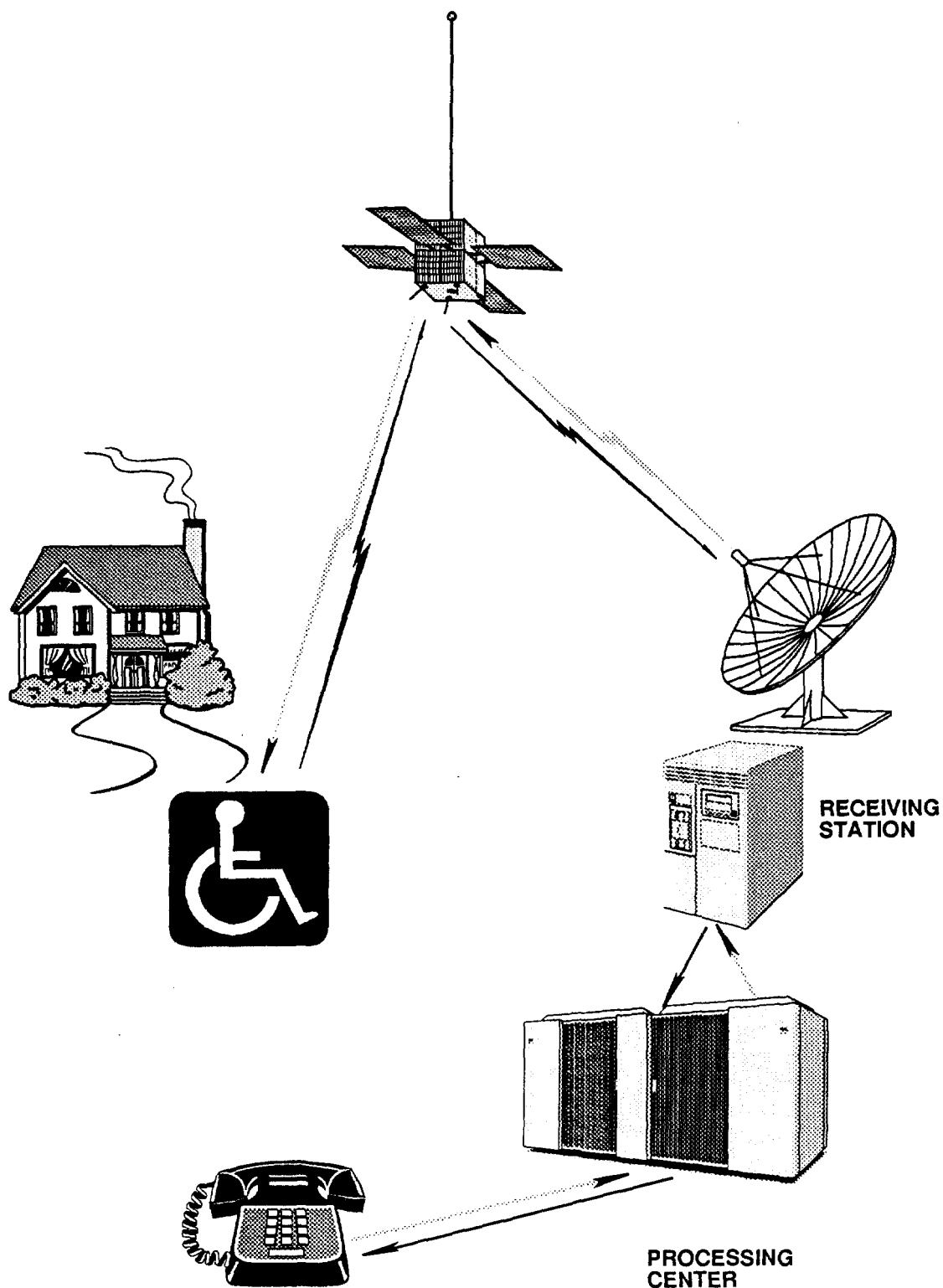
The STARNET system also expects a substantial market among the severely hearing-impaired, for whom the system would be an always available means of visual communications. One of the key benefits of the STARNET design for the handicapped is its interface to the public switched telephone network. As a result, even a voice-impaired person could key-in a person's phone number, and type out a message. The PACC East or PACC West would dial the requested number, and when someone or an answering machine comes on line, would speak out the message using digital voice output processors (see Figure II.F.1).

#### **G. QUANTITATIVE SUMMARY OF STARSYS MARKET APPROACH**

Segmentation of the market is based on the type of terminal used by the customer base. Basically, two types are to be considered:

HELPAC - Two-way low cost terminal:

A terminal from which only one type of message can be transmitted and receipt acknowledged, or a terminal which can be interrogated and can transmit only one message.



## HANDICAP-SUPPORT TELECOMMUNICATIONS

Figure II.F.1

## KEYPAC - Two-way multi-function terminal:

A terminal that can send and receive longer messages and can be interfaced with databases and communication networks (portable PC with communication functions).

These two basic types of terminals lead to the definition of two different types of service:

HELPAAC services: a maximum number of messages per year will be identified through agreement with user.

- Emergency Road Service
- Recreational Search and Rescue (Yachts, Climbers, Etc.)
- Medical Emergency
- Remote Monitoring of:
  - . Houses (Main and Vacation)
  - . Industrial Facilities
  - . Environment (Pollution Control)
- Stolen Property (Cars, Boats, Construction Equipment)
- Container and Box Car Tracking

KEYPAC — A broad array of messaging capabilities for:

- Environmental Monitoring (Weather and Oceanic and Animal Tracking)
- Business (Professional Communications)
- Personal Communications (Toward Information Data Bases and Toward Relations)
- Fleet Management (Trucks, Trains, Rental Cars)
- Handicapped or Elderly, or Ill People (Monitoring of Elderly, Diseased and Handicapped People)
- Navigation and Communication Systems (Yachts, Fishing Vessels, Cars)

## Addressable and Capturable Market

	Address. (In Millions)	Capt. Terminals
Basic:		
• Emergency Road Service	50	5
• Recreational Search & Rescue:		
. Yachts	22	2
. Climbers	22	3
• Medical Emergency	12	3
• With Extra Messages:		
• Remote Monitoring of:		
. Houses (Main and Vacation)	10	2
. Industrial Facilities	5	1
. Environment (Pollution Control)		0.1
• Stolen Property:		
. Cars	130	10
. Boats	22	1
• Containers and Box Car Tracking	5	0.5

## KEYPAC MESSAGES AND ADDED VALUE SERVICES

• Environment Monitorings:		
. Weather & Oceanic & Animal Tracking	1	0.1
• Business:		
. Professional Communications	8	2
. Personal Communications		
-Access Information Data Bases	5	0.5
-Access Other Users	2	0.1
• Fleet Management:		
. Trucks	1.5	0.75
. Trains	1	0.5
. Rental Cars	2	1

• Handicapped Or Elderly Or Ill People	15	3
• Navigation and Communication Systems:		
. Yachts	22	1
. Fishing Vessels	1	0.1
. Cars	130	1

#### Capturable Market

Basic System	27.6 Million Terminals
Two-Way System	10 Million Terminals

#### Market Evolution - Number of Terminals (X1000)

	1995	96	97	98	99	2000	2001	2002
HELPAC	225	600	1200	2025	3075	4425	5325	6375
KEYPAC	75	200	400	675	1025	1475	1775	2125
TOTAL	300	800	1600	2700	4100	5900	7100	8500



## **PART III**

### **AUTHORIZATION OF STARNET WILL SERVE THE PUBLIC INTEREST, NATIONAL INTEREST AND GLOBAL INTEREST IN ENHANCED SAFETY AND ECONOMIC DEVELOPMENT**

Congress, in enacting the Communications Act of 1934, directed the Federal Communications Commission to:

[M]ake available . . . to all the people of the United States a rapid, efficient, Nation-wide . . . radio communications service with adequate facilities at reasonable charges . . . for the purpose of promoting safety of life and property through the use of . . . radio communication. . . .

47 U.S.C. § 151. Further, Congress directed that, in exercising this mandate, the Commission should “[s]tudy new uses for radio, provide for experimental uses of frequencies, and generally encourage the larger and more effective use of radio in the public interest.” 47 U.S.C. § 303(g). Approval of the STARNET system is fully consistent with this broad mandate.

The STARNET system applied for herein will serve the public interest in several different and important ways. It will save lives, protect property, help safeguard the environment, and monitor persons on probation and on parole. The system will also improve the efficiency of American business, especially in the transport sector, thereby enhancing American competitiveness in the global economy. The STARNET system will also serve the national interest in developing a free and open global market in telecommunications services. In so doing, Applicant’s technology is also helping to provide an infrastructure for greater global economic integration.

The STARNET system applied for herein accomplishes all of these public, national and global interest objectives without interfering with any other user. This makes it an extraordinarily efficient user of the frequency

spectrum. It is also important to recognize that the private, non-common carrier structure proposed herein will enhance competitiveness and market responsiveness in the mobile communications business sector. This too implements directly the Communications Act's mandate to allocate spectrum in the public interest, convenience and necessity.

#### **A. THE STARNET SYSTEM WILL SAVE LIVES, PROTECT PROPERTY, HELP SAFEGUARD THE ENVIRONMENT, AND MONITOR PERSONS ON PROBATION AND ON PAROLE**

Safety-of-life and property have long been hallmarks of the public interest, as defined by Congress and by the Commission. See, e.g., 47 U.S.C. § 151. In the 1990s, safety of life and property includes the environment. There is little doubt regarding the deleterious impact of a polluted environment on public health and safety. The STARNET system directly serves the public interest by saving lives, safeguarding property and helping with environmental protection efforts.

##### **1. Demonstrated Search and Rescue Benefits**

The ability of Applicant's technology to help save lives has been demonstrated over and over again. Mariners tossed overboard have been saved only through the Argos LEO positioning satellite system. In addition, nearly identical technology used in the COSPAS/SARSAT system has been credited by NASA with saving the lives of over 1000 downed pilots and marooned yachtsmen. Clearly the public interest would be served by making such a life-saving technology generally available to the entire American public, at a cost of less than \$75 per user terminal (see Figure II.A.3).

##### **2. Demonstrated Anti-Theft Benefits**

The ability of Applicant's technology to combat construction equipment and vehicle theft has been proved in practice. In the Summer of 1987,

Applicant's affiliate, Argos satellite system, was responsible for the first-ever use of space technology in the recovery of a stolen vehicle. A truck belonging to Countrywide Transport had been equipped with one of Applicant's user terminals by the Geostar Corporation of Washington, D.C. While the driver stopped for a coffee break, a thief broke into the vehicle and stole it, not realizing it was one of the first vehicles ever incorporating a satellite tracking device. The Countrywide Trucking company's management alerted Geostar Corporation, which used the Argos-determined coordinates to pinpoint the truck's location on a detailed city map. When the truck stopped, the Los Angeles Police Department was provided with its location and went to both recover the vehicle and arrest the thief.

One of the pioneering differences between the STARNET system applied for herein and its predecessor Argos technology is that the latter only covers the United States several hours a day. The STARNET system will provide 24 hour coverage of the entire world. Accordingly, Applicant's already demonstrated ability to provide anti-theft protection will be measurably enhanced. Such a capability manifestly implements the Communication Act's mandate to use the frequency spectrum for the protection of property (see Figure II.A.2).

### **3. Demonstrated Environmental Monitoring Benefits**

The STARNET system applied for herein will enable a dramatic expansion of Applicant's global environmental monitoring capabilities. In particular, there will be a big reduction in the cost of user terminals resulting from the great increase in capacity and system utilization. With less expensive user terminals it will be possible to effect much more environmental monitoring. These "Mission to Planet Earth" capabilities of the proposed system have dramatic potential to help warn of ecological disaster. Accordingly, they promote not only the public interest of the United States, but the global interest worldwide (see Figure III.A.3).

#### **4. Benefits of Monitoring Parolees and Persons On-Probation**

The U.S. has a very large prison population, and prison construction costs are skyrocketing. There has been considerable success with the use of electronically-supervised parole as an alternative to prison for some criminals. STARNET can serve this need.

For example, over 700,000 are now in jail and nearly two million are on probation. Incarceration costs exceed \$30,000 per person per year. By using the STARNET system, law enforcement agencies can reduce prison populations and help combat crime.

#### **B. THE STARNET SYSTEM WILL IMPROVE THE EFFICIENCY OF AMERICAN BUSINESS, ESPECIALLY IN THE TRANSPORT SECTOR, THEREBY ENHANCING AMERICAN ECONOMIC COMPETITIVENESS**

The public interest is directed not only to safety of life and property, but also to ensuring that the radio spectrum is used to enhance quality of life. A healthy economy is critical to high quality lives. The proposed STARNET system incorporates several important capabilities that are certain to make positive contributions to America's competitiveness in the global economy.

##### **1. Proven Just-In-Time Production Benefits**

Studies in Japan, Europe and the United States have proven many times the economic benefits of just-in-time production techniques. The key to the economic benefits involves avoidance of unnecessary production material inventory. Instead of burdening a factory with stockpiled inventory, such production materials are delivered by truck "just-in-time" for being needed. It should go without saying, however, that a vehicle tracking and communications system plays a critical role in ensuring that "just-in-time" deliveries are on schedule.

For large factories, high power geostationary satellite systems provide a ready answer to "just-in-time" communications